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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/883,981	06/20/2001	John W. Andrews	BU9-98-225 DIV	3116

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MCGINN & GIBB, PLLC
8321 OLD COURTHOUSE ROAD
SUITE 200
VIENNA, VA 22182-3817

EXAMINER	
BLUM, DAVID S	
ART UNIT	**PAPER NUMBER**
2813	17

DATE MAILED: 07/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/883,981	ANDREWS ET AL.	
	Examiner	Art Unit	
	David S Blum	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 March 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *8,15 and 23-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *8,15 and 23-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

This action is in response to RCE, paper #16, filed 03/27/03.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 8, 15, 24-25, 27, 29-32, and 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng (US 5,728,621) in view of Liao (US 6,110,795)

Zheng teaches the device of claims 8, 15, 24-25, 27, 29-32, and 34-35 except for reciting that the trench fill is "seamless" and "substantially scratch free" and co-planar with the substrate. Zheng teaches the device structure of claims in that a thin oxide layer (12) is grown on the substrate (including the non-trench region) as in claim 34, and wide and narrow shallow trenches (figure 6) are formed on a substrate, and the trenches are filled by a non-conformal high density plasma method (18) and the filler is removed from the pad leaving trench fill in the trench and a planar surface. Figure 7 shows the trench fill and the substrate to be co-planar as in figure 6 of the instant application. As the claims are in the format of device (structure) claims, process limitations are given little weight. The filler material is silicon oxide by a high density plasma method (column 3 lines 45-47). It is the high density plasma trench fill method

that results in the seamless trench fill (per instant application). It is obvious that as the process steps are like, the results will be the same. Zheng is also silent as to the surface being scratchless, but teaches the trench fill may be either optionally polished or selectively etched (suggested method) to the pad layer (column 3 lines 15-25). Zheng teaches further removal of the trench fill may be optional. Figure 3 shows the high-density plasma oxide fill to be non-conformal.

Liao also teaches using selective etching (not reactive ion etching) to avoid micro-scratches caused by polishing, but does not etch down to the substrate level. Thus, Zheng teaches a method which will result in the structure being substantially scratch free and Liao teaches which of the methods will yield the desired result. As defined by the specification, chatter marks are caused by CMP and by Liao teaching away from CMP to avoid micro-scratches, the lack of polishing will also eliminate chatter marks.

The limitation where the surface is planarized "without etch back" is considered a process limitation on the product and is given no patentable weight. The surface need only be planarized to be of the same structure.
Even though product-by-process claims are limited by and defined by the process, determination of Patentability is based upon the product itself. The patenability of a product does not depend on its method of production." MPEP 2113

It would be obvious to one skilled in the requisite art at the time of the invention to modify Zheng by choosing a removal method taught by that will result in a substantially scratch free surface as taught by Liao with reasonable expectation of producing a trench fill with a planar surface with reduced surface flaws (Zheng,background, Liao).

3. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng (US 5,728,621) in view of Liao (US 6,110,795) and in further view of Sheppard (US 5729043).

Zheng and Liao teach the device of claim 26 except for the HDP oxide fill comprising a dopant. Sheppard fills trenches with a CVD oxide (160) or in an alternate embodiment, whit a phosphorous containing CVD oxide (240, column 4 lines 46-47) showing an art recognized equivalency.

It is noted that the instant application does not teach any criticality between undoped and doped trench fill material, only reciting that undoped material is preferred (page 5, line 21-page 6 line 2.

It would be obvious to one skilled in the requisite art at the time of the invention to substitute doped oxide for un-doped oxide as Sheppard teaches the two to have an art-recognized equivalence.

4. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng (US 5,728,621) in view of Liao (US 6,110,795) and in further view of Brewer (US 6,322,600).

Zhang and Liao teach all of the parts of the substrate as claimed as recited above except for doping the trench fill. Brewer teaches filling a trench with a dielectric that includes one of BPSG (boron doped oxide glass), PSG (phosphorous doped oxide glass) and HDP oxides. Thus it is known to have a doped insulation trench fill and to obtain the desired dielectric properties, one skilled in the art would know to dope HDP oxide to achieve a dielectric constant to match that of a BPSG or PSG.

It would be obvious to one skilled in the requisite art at the time of the invention to modify Zhang and Liao by adding dopant to the oxide trench fill as suggested by Brewer to produce a trench fill of a desired dielectric constant.

5. Claims 23, 33, and 36-38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng (US 5,728,621) in view of Liao (US 6,110,795) as applied to claim 8 above, and further in view of Wolf.

Zheng and Liao teach all of the device of claims 23, 33, and 36-38 as recited above except for the upper surface of the non-trench region containing implanted dopants. Wolf (pages 48, 58, and 522-523) teaches various transistors in a semiconductor substrate, all with implanted dopants at the upper surface of the non-trench region. On page 48, Wolf teaches Boron (as in claim 37) as the dopant. As the purpose of isolation trenches is to separate devices, including transistors, and that such devices would have dopants in the non-isolation surface, it is obvious that a complete structure would have dopants at the upper surface of the non-trench region as conventional practice.

It would be obvious to one skilled in the requisite art at the time of the invention to modify Zheng and Liao by having dopants such as boron as taught by Wolf to be conventional practice, to produce an isolation trench that separates devices.

Response to Arguments

6. Applicant's arguments with respect to claims 8, 15, and 23-35 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (703)-306-9168 and e-mail address is David.blum@USPTO.gov .

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached at (703)-308-4940. Our facsimile number for Before-Final Communications is (703)- 872-9318 and for After-Final Communications is (703)- 872-9319. The facsimile number for customer service is (703)-872-9317. Our receptionist's number is (703)-308-0956.

David S. Blum

July 17, 2003